CLAIMS:

1. A method for determining an analyte in an assayed sample, comprising:

(a) providing semiconductor nanoparticles carrying a recognition agent capable of specifically binding to the analyte or undergoing a reaction in the presence of the analyte,

(b) contacting said semiconductor nanoparticles with the assayed sample;

(c) providing an acceptor capable of immobilization directly or indirectly, in the presence of the analyte, to the recognition agent;

(d) providing assay conditions, such that in the presence of the analyte in the assayed sample a reaction would occur, resulting in the direct or indirect immobilization of the acceptor to the recognition agent,

(e) irradiating the system so as to cause excitation of the semiconductor nanoparticles and energy transfer to the acceptor; and generation of an electromagnetic signal,

(f) detecting said signal,

whereby the signal is indicative of the presence and/or the amount of said analyte in the sample.

2. The method of claim 1 wherein said nanoparticles are in the form of quantum dots.

3. The method of claim 1 or 2, wherein said signal is emission of light.

4. The method of anyone of claims 1 to 3 wherein the recognition agent and the analyte form a recognition couple and the detection of the analyte is based on the use of a reagent that binds to the formed couple.

5. The method of claim 4, wherein said analyte is a DNA analyte.

6. The method of claim 5, wherein the assay conditions comprise DNA polymerase and nucleotide bases, at least one of said nucleotide bases being bound to an acceptor.

7. The method according to anyone of claims 1 to 6, wherein said acceptor is selected from dye-labeled nucleic acids, dye-labeled oligonucleotide sequences,

nanoparticles-labeled nucleic acids and nanoparticles-labeled oligonucleotide sequences.

8. The method of anyone of Claims 1 to 7, wherein said nanoparticles are excited in a region where absorption of the acceptor is negligible compared to that of the nanoparticles.

9. The method of anyone of Claims 1 to 7, wherein said acceptor is a fluorescent dye.

10. The method of anyone of Claims 1 to 7, wherein the acceptor is semiconductor nanoparticle.

11. The method of claim 5, wherein the analyte is a nucleotide sequence having at least one base mutation.

12. The method according to Claim 11, wherein the assay conditions comprise DNA polymerase and a nucleotide base complementary to the single base mutation and being bound to an acceptor selected from dye moiety and semiconductor nanoparticle.

13. The method of claim 1 wherein the analyte is a catalyst that can induce a reaction in which the recognition agent is converted into a product.

14. The method of claim 13, wherein the catalyst is an enzyme.

15. The method of claim 14, wherein the enzyme is telomerase.

16. The method of claim 15, wherein the assayed sample comprises cellular extract.

17. The method of claim 15 for the detection of cancer cells.

18. The method of anyone of claims 15 to 17 comprising:

(a) providing semiconductor nanoparticles carrying a single-stranded DNA recognition agent, that serves as a primer for telomerase reaction,

(b) providing an assay sample comprising cellular extract from one or more cells suspected of comprising telomerase;

(c) contacting said semiconductor nanoparticles with the assayed sample;

(d) providing nucleotide bases, at least one of said nucleotide bases being bound to an acceptor

(e) providing assay conditions that give rise to a DNA elongation reaction,

(f) irradiating the system so as to cause excitation of the semiconductor nanoparticles, transfer of resonance energy from said nanoparticles to said acceptor and generation of a signal, and

(a) detecting said signal,

whereby the signal is indicating the presence and/or amount of telomerase in the sample.

19. A method according to claim 15 comprising:

(a) providing semiconductor nanoparticles carrying a single-stranded DNA recognition agent, that serves as a primer for telomerase reaction,

(b) providing an assay sample comprising cellular extract from one or more cells suspected of comprising telomerase,

(c) contacting said semiconductor nanoparticles with the assayed sample and in the presence of nucleotide bases;

(d) providing assay conditions enabling telomerase-catalyzed DNA elongation reaction thereby producing telomere repeat units bound to said primer,

(e) providing a nucleotide sequence being complementary to the telomere repeat units and being bound to an acceptor,

(f) providing assay conditions giving rise to a hybridization reaction such that the nucleotide sequence of step (e) may bind to the telomere repeat units,

(g) irradiating the system so as to cause excitation of the semiconductor nanoparticles, transfer of resonance energy from said nanoparticles to said acceptor and generation of a signal, and

(h) detecting said signal,

whereby the signal is indicating the presence and/or amount of telomerase in the sample.

20. A method according to claim 15 comprising:

(a) providing a solution comprising a single-stranded DNA recognition agent, that serves as a primer for telomerase reaction,

(b) contacting said solution with nucleotide bases and an assay sample comprising cellular extract from one or more cells suspected of comprising telomerase and nucleotide bases, thereby enabling telomerase-catalyzed DNA elongation reaction and binding of telomere repeat units to said recognition agent,

(c) contacting the product of step (b) with a nucleotide sequence carrying both semiconductor nanoparticles donor and acceptor, said sequence being complementary to the telomere repeat units such that under assay conditions a hybridization reaction occurs,

(d) irradiating the system so as to cause excitation of the donor of one sequence and transfer of resonance energy from said donor to the acceptor of a neighboring sequence and generation of a signal, and

(e) detecting said signal,

whereby the signal is indicating the presence and/or amount of telomerase in the sample.

21. A sensing device for determining a specific analyte in an assayed sample, the device comprising assay unit comprising a system of semiconductor nanoparticles carrying recognition agent and acceptor capable of immobilization, in the presence of the analyte and under assay conditions, to the recognition agent.

22. The sensing device according to claim 21 further comprising:

(i) irradiation unit for exciting said semiconductor nanoparticles, such that a signal is generated, and

(ii) measuring utility for detecting said signal.

23. The device of claim 21 or 22, wherein said nanoparticles are in the form of quantum dots.

24. The device of anyone of claims 21 to 23 wherein the excitation of the semiconductor nanoparticles is by electromagnetic radiation.

25. The device of claim 24 wherein the electromagnetic radiation is in the UV, visible or IR range.

26. The device of anyone of claims 21 to 25 wherein the semiconductor material is selected from: Group III-V, Group III-V alloys, Group II-VI, Group I-VII, and Group IV semiconductors.

27. The device of claim 26 wherein the semiconductor material is selected from InAs, GaAs, GaP, GaSb, InP, InSb, AlAs, AlP, AlSb, InGaAs, GaAsP, InAsP, CdS, CdSe, CdTe, ZnS, ZnSe, ZnTe, HgS, HgSe, HgTe, CuCl, CuBr, CuI, AgCl, AgBr, AgI, Si, Ge and alloys thereof.

28. The device of claim 27 wherein said semiconductor nanoparticles are in the form of core-shell layered quantum dots.

29. The method of claim 1 wherein said nanoparticles are in the form of core-shell layered quantum dots.

30. A sensing device for determining the presence of two or more different analytes in an assayed sample, the system comprising a plurality of assay units, each unit for determining a specific analyte of the two or more different analytes, and having at least one unit for each of said different analytes, each of said units comprising a system of semiconductor nanoparticles carrying recognition agents and acceptor capable of immobilization, in the presence of the analyte and under assay conditions, to the recognition agent.

31. Sensing device according to claim 30 further comprising:

(i) irradiation unit for exciting said semiconductor nanoparticles, such that a signal is generated, and

(ii) detecting utility for detecting said signal.

32. A kit for the detection of the presence or the amount of an analyte in an assayed sample comprising:

(a) semiconductor nanoparticles carrying a recognition agent;

(b) assay reagents comprising an acceptor capable to absorb the energy emitted by the semiconductor nanoparticles upon irradiation of said

nanoparticles with electromagnetic radiation, thereby generating a signal

(c) optionally a calibration curve showing the relation between the signal and the analyte amount under said assay conditions, thereby determining the amount of said analyte in the sample.

33. The kit according to claim 32 wherein said recognition agent is a single-stranded oligonucleotide.

34. The kit according to claim 32 or 33 wherein said analyte is a DNA analyte and said assay conditions comprise DNA polymerase and nucleotide bases, at least one of said nucleotide bases being bound to an acceptor.

35. The kit according to claim 32 or 33 wherein said analyte is a nucleotide sequence having at least one base mutation and said assay conditions comprise DNA polymerase and a nucleotide base complementary to the single base mutation and being bound to an acceptor.

36. The kit according to claim 33 wherein said analyte is telomerase, said recognition agent is a single-stranded DNA, that serves as a primer for telomerase reaction and said assay conditions comprise nucleotide bases, where at least one of said nucleotide bases is bound to an acceptor molecule.